

MATERNAL OBESITY AND OUTCOME OF PREGNANCY, ARE THEY RELATED?

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ABSTRACT

Objective: To show the increased risk of adverse outcomes in labour and fetomaternal morbidity in obese women (BMI > 30).

Design: A population-based observational study.

Population: Primigravid women with a singleton uncomplicated pregnancy with cephalic presentation of 37 or more weeks of gestation with accurate information regarding height and weight recorded at the booking visit (measured by the midwives) were included in the study.

Methods: Comparisons were made between women with a body mass index of 20-30 and those with more than 30. SPSS version 10 was used for statistical analysis. Student's *t* test, χ^2 and Fisher's exact tests were used wherever appropriate.

Main outcome measures: Labour outcomes assessed were risk of postdates, induction of labour, mode of delivery, macrosomia and shoulder dystocia. Fetal wellbeing was assessed using Apgar <7 at 5 minutes, trauma and asphyxia, cord pH < 7.2, babies requiring neonatal ward admissions, tube feeding and incubator.

Results: We report an increased risk [quoted as odds ratio (OR) and confidence intervals (CI)] of postdates, 1.4 (1.21.7); induction of labour, 1.6 (1.31.9); caesarean section, 1.8 (1.42); macrosomia, 2.1 (1.62.6); shoulder dystocia, 2.9 (1.45.8); increased neonatal admissions with complications such as neonatal trauma, feeding difficulties and incubator requirement.

Conclusion: Obese women appear to be at risk of intrapartum and postpartum complications. Induction of labour appears to be the starting point in the cascade of events. They should be considered as high risk and counseled accordingly.

Keywords: Outcome; Pregnancy; Maternal; Obesity; Relationship

INTRODUCTION

Obesity has assumed epidemic proportions in the developed world.¹ An increased association of morbidity and mortality with obesity is well established in both pregnant and non-pregnant women.²⁻⁶ Maternal obesity has been reported as a risk

factor for various antenatal, intrapartum, postpartum and neonatal complications such as postdates, induction of labour, macrosomia, shoulder dystocia, prolonged duration of labour, increased blood loss, caesarean section rates and neonatal admissions.³⁻⁶

The majority of the published research is from the United States^{4, 5, 7} and is based on sample populations with confounding variables such as diabetes, pre-eclampsia and chronic hypertension. A similar research in the British population is limited to one large study, which again includes confounding variables.³ The present study was done to determine the role of maternal obesity on pregnancy outcomes in pregnant women in an Iranian population.

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PATIENTS AND METHODS

Primigravid women (18-35 years old) with a singleton, uncomplicated pregnancy, with cephalic presentation of 37 or more weeks of gestation and with accurate information regarding height and weight recorded at the booking visit (measured by the midwives) of Zeinabieh Hospital, Shiraz (Iran) were included in the study. Exclusions included babies with any congenital abnormalities, women with pre-eclampsia, gestational diabetes and medical disorders such as diabetes mellitus, chronic hypertension, cardiac or endocrine disorders and surgical conditions. This allowed reduction of confounding factors to a minimum.

The resulting sample was stratified into two groups as follows: Group 1 (N=120) with body mass index (BMI) between 20 and 30, which was considered as the comparison group; and Group 2 (N=120) with BMI of more than 30, which was the study group.

Demographic details such as maternal age, ethnicity and smoking habit were collected. Outcome measures assessed included postdates, induction of labour, macrosomia (macrosomia was defined as birth weight of more than 4000 g), mean duration of labour, delay in the second stage of labour, operative delivery and maternal and perinatal morbidity. A clinically useful definition of macrosomia would be a birth weight above the 90th centile; however, we were unable to obtain centile birth weights from the database. Moreover, the definition of macrosomia in the literature varies between >4000 and >4500 g; accordingly, our view is that birth weight >4000 g is an adequate definition of macrosomia for the purposes of this study. Postdates were defined as a pregnancy over 41 weeks of gestation, usually confirmed by early ultrasound scan. This definition was used, as it is the unit policy to review women at 41 weeks of gestation to book them for induction of labour between 40 weeks + 10 days and 42 weeks. As the gestational age is recorded in completed weeks of gestation in the database, we were unable to obtain information about the number of days of gestation. Perinatal outcome measures included Apgar scores at 5 minutes of less than seven, neonatal unit admissions, trauma and asphyxia. Trauma included all types of injuries like

superficial skin cuts, grazes, bruises to deeper ones like fractures, muscle haematomas, dislocations, cephalhaematomas and nerve palsies. Asphyxia was based on the neonatologist's clinical impression of the baby depending on factors like Apgar scores, respiratory difficulty, blood pressure, pulse, muscle tone and coma if present. The effect of weight and height individually on these above mentioned outcome measures was analysed separately by using an independent sample *t* test.

SPSS version 10 was used for statistical analysis. Student's *t* test, χ^2 and Fisher's exact tests were used wherever appropriate. A *P* value of less than 0.05 was considered to be significant. Odds ratios (ORs) with confidence intervals (CIs) were used to quantify the risk.

RESULTS

A total of 1570 pregnancies were recorded in the database between 2004 and 2005. After strict application of inclusion and exclusion criteria, the study sample consisted of 240 pregnancies.

The demographic features such as mean age (26.7 ± 3.8 *vs* 24.8 ± 4.1 years) and percentage of smokers [(22%) *vs* (23%)] were not significantly different in the comparison group and study group respectively.

Table 1. Labour outcomes.

The values are presented as *n* (%) or mean [SD].

Outcome	Group 1 (120), BMI 20-30	Group 2 (120), BMI > 30	<i>P</i> /OR (CI)
Postdates	35 (29.5)	48 (40.5)	1.4 (1.2-1.7)
Induction	53 (44.4)	77 (64.2)	<i>P</i> =0.017
Mean duration of labour			
First stage (hours)	7.7 [4.0]	8.09 [4.2]	<i>P</i> = 0.06
Second stage (minutes)	88.3 [67.6]	92.5 [7.6]	<i>P</i> = 0.2
Second stage (>2 hours)	25 (21)	27 (23)	1.0 (0.8-1.2)
Macrosomia	10 (12)	15 (18)	2.1 (1.6-2.6)
Mode of delivery			
Assisted vaginal delivery	31 (25.8)	30 (25)	<i>P</i> = 0.6
Caesarean section	16 (19.2)	29 (35)	1.8 (1.4-2.2)

As it is evident from Table 1, women with a BMI > 30 were at increased risk of postdates pregnancy and more likely to require induction of labour. Mean durations of first stage of labour (hours) and second stages of labour (in minutes) were not significantly different between the groups. Similarly prolonged second stage (>2 hours) was also not significantly different. Although there did not appear to be an increased risk of assisted vaginal delivery, the group of women with a raised BMI was found to be at 1.8 times the risk of caesarean section *versus* the other group. There was also a doubling of the risk of a macrosomic baby in those with BMI > 30 and this group was also four times more likely to have shoulder dystocia.

Table 2. Neonatal complications.

Values are presented as *n* (%). Odds ratios are included when significant.

Complications	Group 1 (BMI 20-30)	Group 2 (BMI > 30)	OR (CI)
Apgar at 5 minutes (<7)	1 (0.83)	2 (1.66)	
Neonatal trauma	6 (5)	10 (8.33)	1.5 (1.12.1)
Neonatal unit admissions	3 (2.5)	5 (4.1)	1.5 (1.092.3)
Tube feeding	5 (4.1)	8 (6)	1.5 (1.082.0)
Incubator requirement	3 (2.5)	5 (4)	1.6 (1.012.6)

Table 2 shows data on neonatal morbidity. Babies born to women with a BMI of more than 30 appeared to be at an increased risk of birth trauma, and required more admissions to the neonatal unit and were more likely to require assistance with feeding and maintenance of body temperature.

The effect of weight and height was considered independently as two separate variables and subjected to an independent *t* test. Women who had postdate pregnancies, induction of labour or macrosomia were significantly heavier than those who did not. Delivery by caesarean section was also significantly more frequently performed in those with increased weight. Height was significantly different in those requiring induction of labour and macrosomia.

DISCUSSION

Obesity is a growing epidemic and its effect on the outcome of pregnancy and delivery in the healthy Iranian population has not hitherto been extensively studied. This study, drawn from a population-based

set of uncomplicated, primigravid women, aims to report the effect of maternal obesity on obstetric complications with minimal confounding bias.

An increasing trend towards obesity was found over the last 10 years, and at present, one-third of our pregnant population has a BMI greater than 30. This is similar to the national trend (prevalence rate increased by 1.6% between 1993 and 1996) documented in the fifth 'Confidential Enquiries into Maternal Deaths'.⁸ A previous UK study reported a higher incidence of obesity (10.9%) in their population.³ However, inclusion of pregnancies with medical complications may account for the higher rate reported in this study.

Although the mean age in those who were obese did not significantly differ from the comparison group in this study, it has been reported that increasing age is an added risk factor for obesity.⁹⁻¹¹ This is evident from the 'Confidential Enquiries into Maternal Deaths 1997-1999', which reported more pregnancies occurring in women of more than 25 years of age in 1997-1999 compared with 1988-1990.⁸ We were not able to evaluate the association of race in this study, as the majority of our population was Persian. However, it has been previously reported that South Asian and Afro-Caribbean women are more likely to be obese (OR 1.83 and 3.01, respectively) compared with the native British population.¹²

This study detected a higher incidence of postdates, induction of labour, caesarean section, macrosomia and shoulder dystocia in the group of women with increased BMI. Macrosomia has been consistently reported by many researchers (with OR ranging between 1.5 and 2.2).³⁻⁷ Similarly, the increased risk of shoulder dystocia has also been reported.^{4,10,13,14} However, increased risks of factors leading to perinatal morbidity such as neonatal trauma and admission to special care unit have been reported in only a few studies.¹⁵⁻¹⁸ Although an increased risk of postdates^{14,18,19} has not been previously demonstrated, these women do appear to require induction of labour more frequently (OR 2.14).^{3,9} This can probably be explained by the inclusion of women with other medical conditions

such as diabetes, pre-eclampsia, and so forth, and therefore the need for induction for other indications. Our findings of an increased risk of caesarean section in women with a BMI > 30 is in accordance with other published work and the excess risk appears to be one to twofold.³⁻⁷ One study showed that even in low risk obese women with otherwise normal pregnancies who are managed by nurse midwives, the risk of caesarean section was higher.²⁰

This study, however, clearly demonstrates the increased risk associated with embarking upon a pregnancy when overweight and shows that this group of women need to be regarded as 'high risk' when counseling and risk assessment is done in the antenatal clinic. Many women who died in the triennium (1997-1999) were classified as obese.²¹ It has been recommended in the fifth 'Confidential Enquiries into Maternal Deaths' that all mothers should have their BMI calculated at booking as a part of the full risk assessment and should be offered advice about sensible weight reduction, including diet and exercise and referral to a dietician where appropriate. It has also been recommended that the midwives should inform mothers who are obese about how to recognize early warning signs of complications.

In summary, this study demonstrates and confirms that an increased BMI increases the incidence of macrosomia, the need for obstetric interventions and consequent morbidity in mother and baby. Awareness of these findings needs to be increased in both women planning a pregnancy and their caregivers.

Further research is needed to explore pathophysiology of postdates in obese women and intervention studies of the management of obesity in pregnancy.

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